IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:	Gleeson, et al.		
Application No.:	10/609,115	Examiner:	NGUYEN, Dung T.
Filed:	June 27, 2003	Docket No.:	KNST 200019

For: ELECTRO-CONVECTIVE DIFFRACTIVE DEVICE

MAIL STOP APPEAL BRIEF – PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF UNDER 37 C.F.R. § 41.37

Dear Sir:

Applicant transmits herewith one (1) originally signed copy of the second APPEAL BRIEF UNDER 37 C.F.R. § 41.37 for the above-identified patent application.

The fees required under 37 C.F.R. §41.20(b)(2) have already been paid in connection the Appeal Brief previously filed on September 13, 2006.

If there are any additional fees and/or extension of time fees required by this communication, please charge same to Deposit Account No. 06-0308.

Respectfully submitted,

FAY SHARPE LLP

May 25, 2007
Date

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CERTIFICATE OF ELECTRONIC TRANSMISSION

I hereby certify that this paper and/or fee is being transmitted to the USPTO by electronic transmission via EFS-Web on the date indicated below.

Cathryn Terchek

Date: May 25 2007

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT(S)	:	Gleeson, et al.
TITLE	:	ELECTRO-CONVECTIVE DIFFRACTIVE DEVICE
APPLICATION NO.	:	10/609,115
FILED	:	June 27, 2003
CONFIRMATION NO.	:	8164
EXAMINER	:	Nguyen, Dung T.
ART UNIT	:	2871
LAST OFFICE ACTION	:	April 9, 2007
ATTORNEY DOCKET NO.	:	KNST 200019 (KSU.231)

APPEAL BRIEF UNDER 37 C.F.R. §41.37

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This Appeal Brief is in furtherance of the second Notice of Appeal mailed to the U.S. Patent and Trademark Office on April 20, 2007.

The fees required under 37 C.F.R. §41.20(b)(2) have already been paid in connection with the Appeal Brief previously filed on September 13, 2006.

Appellant files herewith an Appeal Brief in connection with the above-identified application wherein claims 1-7 were finally rejected in the Final Office Action of April 9, 2007.

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I hereby certify that this paper and/or fee is being transmitted to the USPTO by electronic transmission via EFS-Web on the date indicated below.

Cathryn Terpnek

Date: May 25 2007

I. REAL PARTY IN INTEREST (37 C.F.R. §41.37(c)(1)(i))

The real parties in interest in this appeal are the inventors named in the caption of this brief (James T. Gleeson and Joshua S. Martin) and the assignee of their interests, Kent State University.

II. RELATED APPEALS AND INTERFERENCES (37 C.F.R. §41.37(c)(1)(ii))

Currently, it is believed that there are no other appeals or interferences in process or pending before the U.S. Patent and Trademark Office which the present application bases its priority from, or any cases which base their priority upon the present application, that will directly affect, or will be directly affected by, or will have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS (37 C.F.R. §41.37(c)(1)(iii))

The status of the claims set forth after the final office action mailed April 9, 2007 was, and is, as follows:

Allowed Claims: none

Rejected Claims: 1-7

The present appeal is directed specifically to claims 1-7.

IV. STATUS OF THE AMENDMENT (37 C.F.R. §41.37(c)(1)(iv))

No amendments have been made that have not been entered by the Examiner.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER (37 C.F.R. §41.37(c)(1)(v))

There are two independent claims pending in the application, claims 1 and 4.

Claim 1 is directed to a tunable diffraction grating (page 4, line 9) comprising a cell with a first cell wall spaced from a second cell wall (page 4, lines 10-11); electrodes disposed on facing surfaces of the first and second cell walls (page 9, lines 14-15); and an array of nematic liquid crystal convective rolls (page 5, line 4), wherein the convective rolls are arranged periodically in a space between the first cell wall and second cell walls (page 7, lines 3-4); and a polymeric network stabilizing the array of nematic liquid crystal convective rolls (page 5, lines 5-6). Figure 3 exhibits this structure.

Claim 4 is directed to a method for producing a diffraction grating comprising the steps of: introducing a polymerizable mixture including nematic liquid crystal, dopant, and polymerizable precursor between two electrically conductive substrates (page 6, lines 25-27); applying a potential difference across the polymerizable mixture to cause the nematic liquid crystal to assemble into an array of convective rolls (page 7, lines 1-2); and stabilizing the convective roll structure by forming a polymer network from the polymerizable precursor (page 7, lines 10-13), wherein the polymer network is bounded by the convective roll structure (page 5, lines 24-25). No Figures are directed to this claim.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL (37 C.F.R. §41.37(c)(1)(vi))

The Examiner rejected claims 1-7 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,864,931 to Kumar et al. ("Kumar").

VII. ARGUMENTS (37 C.F.R. §41.37(c)(1)(vii))

The Examiner has rejected claims 1-7 under 35 U.S.C. §103(a) as being unpatentable over Kumar. Appellants respectfully traverse the rejection as follows.

A. The §102 Rejection

The Examiner's rejected the present claims over Kumar, which discloses a diffraction grating constructed using a liquid crystal and pre-polymer formulation. While there may be superficial similarities between Kumar and the present invention, the essential claimed physical elements of the grating structure and the method of its formation is inherently different.

The common elements of both Kumar and the present invention, as pointed out by the examiner, i.e. "first and second cell wall", "electrodes", "polymeric network" and "power source", are common in an enormous variety of liquid crystal/polymer technologies, and are not novel in and of themselves in either the present invention or Kumar (or many others). The novelty of the present invention, in part, is the formation and presence of the claimed convective rolls, and the precise physical makeup and properties of the resulting diffraction grating.

Both inventions teach construction of a diffraction grating, which can only be possible when a structure possesses optical properties which are periodic in space, that is, the same structure repeats itself in space with a well defined length, like a traditional grating comprised of evenly spaced lines engraved into glass.

However, there are at least three fundamental differences between Kumar and the present invention: namely i) the presence of convective rolls in the present invention but not in Kumar, which in turn is due at least in part to the ii) the manner in which the spatially periodic optical structure is formed in each invention, and the iii) the necessity for a phase-separation process required by Kumar, but not by the present invention.

First, with regard to item i) above, Kumar simply fails to disclose the presence of nematic liquid crystal convective rolls, as taught in the present invention and required by the present claims. In this respect, the Examiner erroneously, and

without support of any kind, states that the "microlens (90)" in Kumar is somehow similar to or corresponds to the liquid crystal convective rolls in the present invention. In fact, quite the opposite is true. The differences between the convective rolls of the present invention and the microlens of Kumar are enormous. For example, the microlens in Kumar simply functions to switch the structure between focusing and non-focusing states while remaining transparent in both states (col. 10, lines 45-50). The convective rolls of the present invention, on the other hand, form the diffraction grating and can be used to alter the structure factor of the diffraction grating by changing the applied magnetic field. In addition, in the convective rolls of the present invention, the liquid crystal flows in a rotating fashion, with neighboring rolls rotating in opposite directions and wherein the structure of the convective roll array depends on the amplitude and frequency of the applied field (see page 2, lines 11-24). The microlenses of Kumar are distinctly different and present no such properties.

Perhaps most notably, in Kumar's microlens, there is no motion of the liquid crystal, whereas in our convective rolls (3), the liquid crystal is moving and the liquid crystal directors within the rolls can be altered by application of an electric field (page 8, lines 13-16). All of these differences simply show that the microlenses of Kumar are not equivalent to and do not correspond with the convective rolls of the present invention. The Examiner cannot provide any evidence of their equivalency.

The Examiner provides absolutely no support for his contention that the microlens of Kumar is the same as the convective rolls of the present invention, but merely provides a blanket statement to that effect. Where is the Examiner getting the idea that the two structures are identical? Such an unsubstantiated statement fails to meet the Examiner's burden of showing each and every feature of the claims in the prior art reference, as required for an anticipation rejection under §102.

While not specifically recited as claim limitations, evidence of the differences between the invention of Kumar and the present claims is evidenced in the manner in which the devices are formed and the differences in these processes. In this respect, and with regard to item iii), in Kumar, the mixture of liquid crystals and prepolymer forms into the desired structure through the phase separation process (Column 2, lines 63-64). During this process, the initial ingredients separate

from themselves in a manner analogous to oil and vinegar separating in salad dressing. The two separate phases (liquid crystal rich-polymer poor and polymer rich-liquid crystal poor) remain separate after the polymerization process. The present invention relies on no such separation, in contrast, the pre-polymer is present in very dilute amounts and during the polymerization process, the pre-polymers bond with each other chemically throughout the liquid crystal.

Each of these differences is profound, and the two inventions teach entirely different approaches towards building a device. The approach used in Kumar would be wholly inapplicable in building an electro-convective diffractive device, and vice versa.

Claim 4 is Separately Patentable

With regard to item ii) above, in Kumar, two methods are taught to form the grating (Column 3, lines 15-17), "using a photomask" and "a collimated beam of light". In the present invention, the grating structure forms *spontaneously* upon the application of an electric potential difference having appropriate amplitude and frequency. That is, in Kumar, the physical properties of the formed grating are determined by the photomask or the collimated beam of light, whereas in the present invention, they are determined by the convective roll structure which spontaneously arises. Kumar simply fails to teach the presently claimed step of "applying a potential difference across the polymerizable mixture to cause the nematic liquid crystal to assemble into an array of convective rolls".

Claim 2 is Separately Patentable

Claim 2 is separately patentable because Kumar fails to teach "wherein the convective rolls are arranged with a grating constant spacing approximately twice the separation distance between said first and second cell walls".

Claim 7 is Separately Patentable

Claim 7 is separately patentable because Kumar fails to teach a method of forming a diffraction grating including convective rolls "wherein said convective rolls are arranged with a structure factor after said step of stabilizing, and

the method further comprises, after said step of stabilizing [the convective rolls]: adjusting the structure factor by application of an electric field though at least one of the electrically conductive substrates". Kumar makes no mention of structure factor and does not teach tuning the structure factor through the application of an electric field.

B. Conclusion

In view of the above, Appellant respectfully submits that claims 1-7 are in condition for allowance. Accordingly, it is respectfully requested that the Examiner's rejections be reversed.

If any fee is due in conjunction with the filing of this response, Applicants authorize deduction of that fee from Deposit Account 06-0308.

Respectfully submitted,

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VIII. APPENDIX OF CLAIMS (37 C.F.R. §41.37(c)(1)(viii))

1. A tunable diffraction grating comprising:

a cell with a first cell wall spaced from a second cell wall;

electrodes disposed on facing surfaces of the first and second cell walls; and

an array of nematic liquid crystal convective rolls, wherein said convective rolls are arranged periodically in a space between said first cell wall and said second cell wall; and

a polymeric network stabilizing said array of nematic liquid crystal convective rolls.

2. The tunable diffraction grating of claim 1, wherein the convective rolls are arranged with a grating constant spacing approximately twice the separation distance between said first and second cell walls.

3. The tunable diffraction grating of claim 1, further comprising:

a power source connected to said electrodes to apply an electric field, wherein said convective rolls are arranged with a structure factor, and said structure factor is adjusted by application of an electric field though said power source.

4. A method for producing a diffraction grating comprising the steps of:

introducing a polymerizable mixture including nematic liquid crystal, dopant, and polymerizable precursor between two electrically conductive substrates;

applying a potential difference across the polymerizable mixture to cause the nematic liquid crystal to assemble into an array of convective rolls; and

stabilizing the convective roll structure by forming a polymer network from the polymerizable precursor, wherein the polymer network is bounded by the convective roll structure.

5. The method according to claim 4, wherein the polymerizable mixture further includes an initiator, said initiator being activated in said step of stablizing to initiate the formation of the polymer network from the polymerizable precursor.

6. The method according to claim 5, wherein the initiator is a photoinitiator and said step of stabilizing includes photoinitiation of the photoinitiator.

7. The method according to claim 4, wherein said convective rolls are arranged with a structure factor after said step of stabilizing, and the method further comprises, after said step of stabilizing:

adjusting the structure factor by application of an electric field though at least one of the electrically conductive substrates.

IX. EVIDENCE APPENDIX (37 C.F.R. §41.37(c)(1)(ix))

None.

X. RELATED PROCEEDINGS APPENDIX (37 C.F.R. §41.37(c)(1)(x))

None.